

## *Management Systems at the Strategic Level*



### *Office of Systems Analysis Planning* Road School

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**Driving Indiana's Economic Growth**

## Purpose

- To give a general overview of the INDOT Highway network and the Office of Systems Analysis Planning.



# Outline

- INDOT Highway Network
- INDOT Work Program
- Systems Analysis Planning Mission
- Office of Systems Analysis Planning
- Management Software
- Z-Score Analysis



## INDOT Highway Network

- Approximately 11,300 miles of State maintained highways
  - 1,170 Miles of Interstate Highways
  - 2,500 miles in the Non-Interstate National Highway System (NHS)
  - 8,800 miles Non-NHS
- Nearly 28,000 lanes miles of State maintained highways
- Over 40 billion Total Vehicle Miles Travel (vmt)
  - Interstate AADT
    - 8 - lane average AADT – 140,000 vehicles per day
    - 6 - lane average AADT – 87,000 vehicles per day
    - 4 -lane average AADT – 30,000 vehicles per day
  - Non-Interstate AADT
    - 4 - lane average AADT – 17,000 vehicles per day
    - 2 - lane average AADT – 4,500 vehicles per day



## INDOT Highway Network

- Nearly 5,300 State Maintained Bridges
  - Nearly 44,000,000 syds of bridge deck
  - Nearly 1,200 Interstate bridges
  - Over 4,000 Non-Interstate bridges
- Approximately 2600 bridges inspected annually
- 2004 State Maintained Highway Crash Results
  - Nearly 58,000 crashes-crash rate
    - Approximately 160 crashes/100 million vehicle miles traveled
  - Over 400 fatal crashes – Nearly 500 fatalities
  - Nearly 13,500 injury crashes – 20,000 injuries
  - 44,000 property damage only crashes



## INDOT Work Program

**Over \$800 million Construction Program per year**

- **Over \$300 million Major New**
  - Added Travel Lanes (ATL)
  - New Road Construction
- **\$200 million Major Pavement**
  - Pavement Rehabilitation/Reconstruction
- **\$200 Million District Work Program**
  - Includes Pavement/Bridge Preservation
  - Other work such as guardrail repair, traffic, small structure replacement, etc.)
- **\$100 million Safety, Intersection Improvement, etc.**



## Systems Analysis Planning Mission

- Analyze, assess and report on the condition of the state-maintained highway in 4 core areas
  - Pavement
  - Bridges
  - Congestion
  - Safety
- We analyze LPA section as well
- Analyze the performance of INDOT in maintaining the state highway system
  - Can assist in setting funding levels
  - Can assist in setting work programs



## Systems Analysis Planning Mission

- Assess the performance of INDOT in maintaining the state highway system
  - Sets Operational Performance Indices (OPI's) for four core areas
  - Collects and compiles data in these areas to assess how INDOT is doing in these cores areas
- Report on the performance of INDOT in maintaining the state highway system
  - Annual "State of the System" report
  - Quarterly reports to the Governor and other concerned parties



## Office of Systems Analysis Planning

- Manager- Andrew Fitzgerald, PTOE, PE
- Pavement Management Unit-William F Flora, PE
- Bridge Management Unit -Jaffar Golkhaje, PE
- Congestion Management Unit – Mike McBride
- Safety Management Unit-John Nagle, PE
- Local Program Management-Jeanette Wilson
- Operation Analyst- Autumn Young



## Management Software

- Management software is used to compile and analyze data
- Inventory managed using Exor
- dTIMS CT used for Pavement Management
  - Uses pavement condition data collected by Pathway Services, Inc.
  - Uses Exor database for inventory data
  - Looking at connecting to the district work program managed by Agile Assets database
  - Uses Pavement Quality Index (PQI) as an OPI
- IBMS used for Bridge Management
  - INDOT produced bridge management system
  - Uses Bridge Inspection database for condition and inventory information
  - Uses Wearing Surface, Deck & Paint Condition, and Sub & Super Structure as OPI's
  - Looking at converting IBMS to dTIMS CT



# Management Software

- Congestion management is under development
  - Looking at developing a management system in dTIMS CT
  - Uses traffic data collected by INDOT
  - Will use V/L ratio (V=Volume, L= theoretical AADT limit) as an OPI
  - Looking at using delay as an OPI
- Safety management is under development
  - Uses the Vehicle Crash Records System for data
  - Looking at developing a management system in dTIMS CT
  - OPI's are still in development for safety area
- Eventually all management systems will become inputs into an Assess Management System
  - Using this system, INDOT will be able to do tradeoff analysis based on a "Z" score analysis
  - Be able to easily view data & OPI's

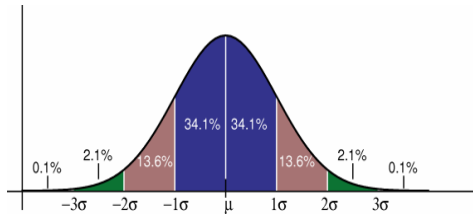


# "Z" score analysis

- Convert all condition ratings to a common score using basic statistics
  - Assume the ratings are normally distribution and there is a large sample size
  - Determine the mean and standard deviation for each rating
  - Convert to a "Z" score using  $Z = (X - \mu) / \sigma$
  - This score equalizes each rating so it does not matter how each rating is produced
  - Major break points are at  $\pm 1$  standard deviation and the mean



## "Z" score analysis



- Use PQI For Example  $\mu=79$   $\sigma=14$
- At +1 Standard Deviation PQI = 93
- At -1 Standard Deviation PQI = 65

- In the case of PQI
  - 93 and above is in excellent shape (Do Nothing)
  - Between 79 & 93 is in good condition (Do PM)
  - Between 65 & 79 is in fair condition (Do Functional Treatment)
  - 65 and below is in poor condition (Do Rehab/Reconst Treatment)
- Other areas can do similar analysis
  - These different scores can be combined to create a combined score



## Conclusion

- Future endeavors
  - Create a Geometric Management System
    - Evaluate the geometric condition of roads at a strategic level
    - Planned geometric updating of roads to the proper standard based on the type of road
    - Analyze, assess and report the geometric standards of the state maintained system
  - Train district personnel in management systems
  - Implement a structural component to the pavement management analysis



## Conclusion

- Future endeavors
  - Possibly use dTIMS CT to develop and implement Bridge, Congestion, and Safety Management Systems
  - Use the 4 management systems and other information to develop an asset management system
  - Continue to use the data produce by the systems to evaluate the performance of INDOT
  - Implement improved statistical analysis



## Thank You

Any Questions

